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SHOCK TUBE TEST OF A 36-INCH BLAST VALVE

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August 1972

BRL MR 2213

BRL

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MEMORANDUM REPORT NO. 2213

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by

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U.S. ARMY ABERDEEN RESEARCH AND DEVELOPMENT CENTER
BALLISTIC RESEARCH LABORATORIES
ABERDEEN PROVING GROUND, MARYLAND

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) U.S. Aberdeen Research & Development Center Ballistic Research Laboratories Aberdeen Proving Ground, Md. 21005	2a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED 2b. GROUP

3. REPORT TITLE

SHOCK TUBE TEST OF A 36" BLAST VALVE

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

5. AUTHOR(S) (First name, middle initial, last name)

R.L. Peterson

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
August 1972	14 15	0

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
b. PROJECT NO.	BRL Memorandum Report No. 2213
c. AMCMS No. 5910.22.61252	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
d.	

10. DISTRIBUTION STATEMENT

Approved for public release; distribution unlimited.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
	Office Chief of Engineers P.O. Box 8 Fort George Meade, Md. 20755

13. ABSTRACT

A 36" blast valve was positioned in a duct, branching from an 8 ft diameter shock tube, and subjected to blast in both the open and closed position.

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Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Blast Valve						
Shock Tube Test						

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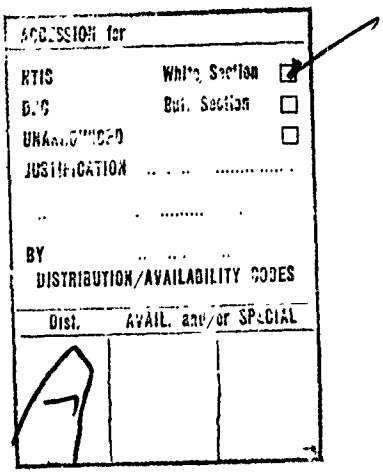

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BALLISTIC RESEARCH LABORATORIES

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Terminal Ballistics Laboratory

Work was supported by Corps of Engineers
on AMCMS No. 5910.22.61252

ABERDEEN PROVING GROUND, MARYLAND

I. INTRODUCTION

At the request of Corps of Engineers, personnel of Ballistics Research Laboratories subjected a blast valve to a series of six shock tube generated tests during the period 22 February through 7 March 1972. The test subjected valve is a 36 inch butterfly-type designed for installation in air conditioning ducting of hardened underground sites to protect personnel in the event of an nuclear explosion.

II. OBJECTIVES

The test objectives were to determine the structural integrity of the valve body under shock loadings and to dynamically test the automatic valve closure trigger mechanism. Testing parameters as set forth by Corps of Engineers were to be shock levels of 2, 3, 10 and 25 psi overpressure with the valve tested in both open and closed mode. During a planning meeting held with representatives of Corps of Engineers, Aberthau Construction Co. and BRL, it was agreed that BRL would supply the blast environment required to meet Corps of Engineers testing criteria, but would not evaluate the valve's performance.

III. PROCEDURE AND RESULTS

Testing was accomplished utilizing the 8' diameter shock tube at the BRL Dual Shock Tube Facility. The valve was installed with standard flange mounting in a 36" diameter branch duct. Four data channels of shock wave histories were obtained using CEC type 4-316 unbonded strain pressure transducers and recorded on a CEC 12" oscillograph. Angle of valve vane rotation was recorded through use of a rotary potentiometer affixed to the vane shaft. Following each test the valve was operated manually to determine its continued ability to function.

The location of the data acquisition points, valve placement and test layout are shown in Figure 1. Figures 2 through 7 show the pressure time records acquired during the shot condition tested. Table 1 lists pertinent shock data.

TABLE 1

Shot No.	Station P-2 P_s	Valve Position at shock arrival	Temp. °C	P_{amb}
8-72-1	28.45*	Closed	1.0	30.27
8-72-2	2.10	Open	10.3	30.09
8-72-3	2.29	Open	12.46	29.95
8-72-4	26.74*	Closed	14.98	29.96
8-72-5	2.22	Open	2.90	29.71
8-72-6	11.49	Open	4.76	30.23

*Shock Reflection

P_s: Shock Overpressure

Valve Position: 5^o = open
$83^o45'$ = closed

P_{amb}: in. mercury

The valve endured the tests with no apparent damage.

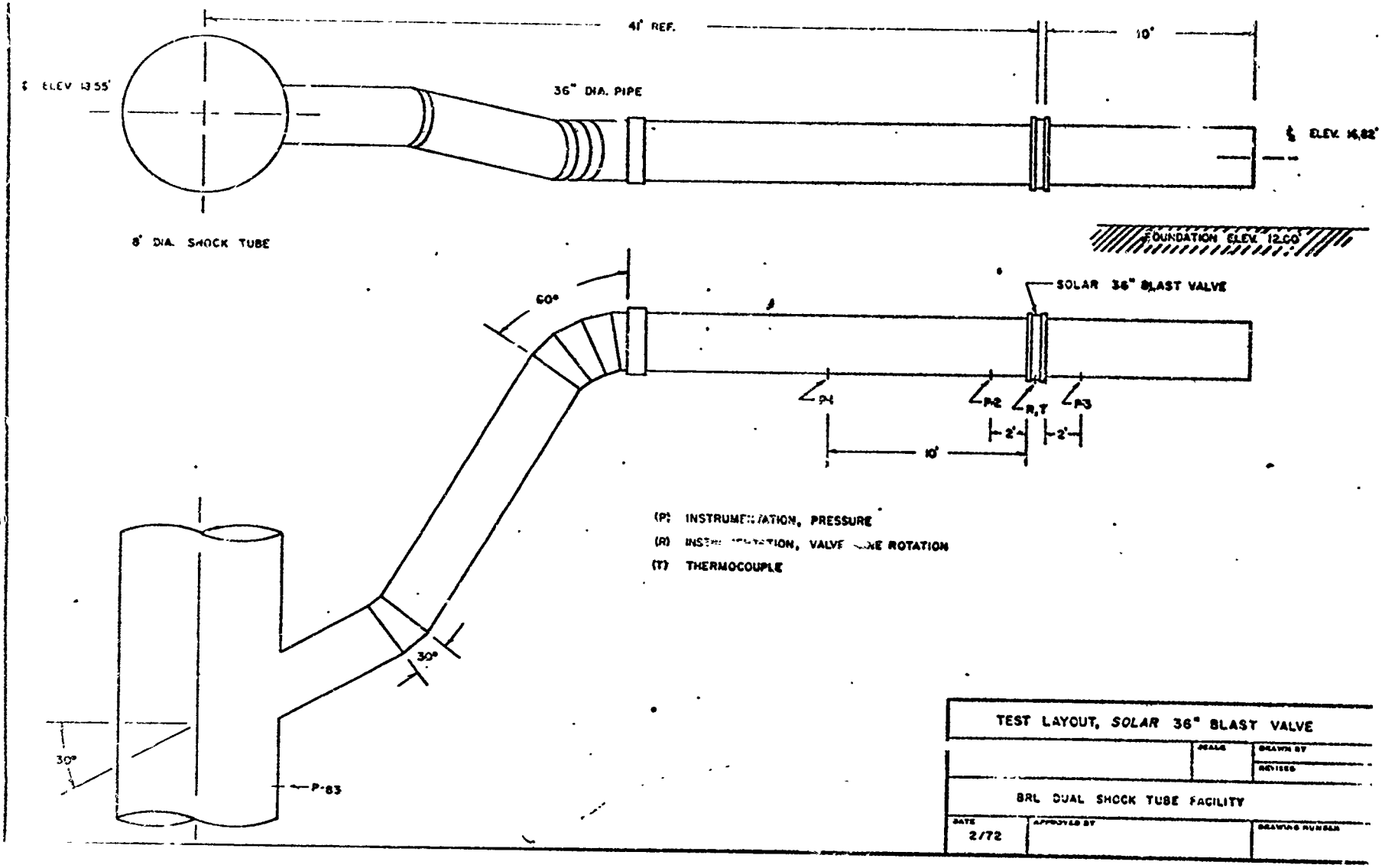

Figure 1. Test Layout

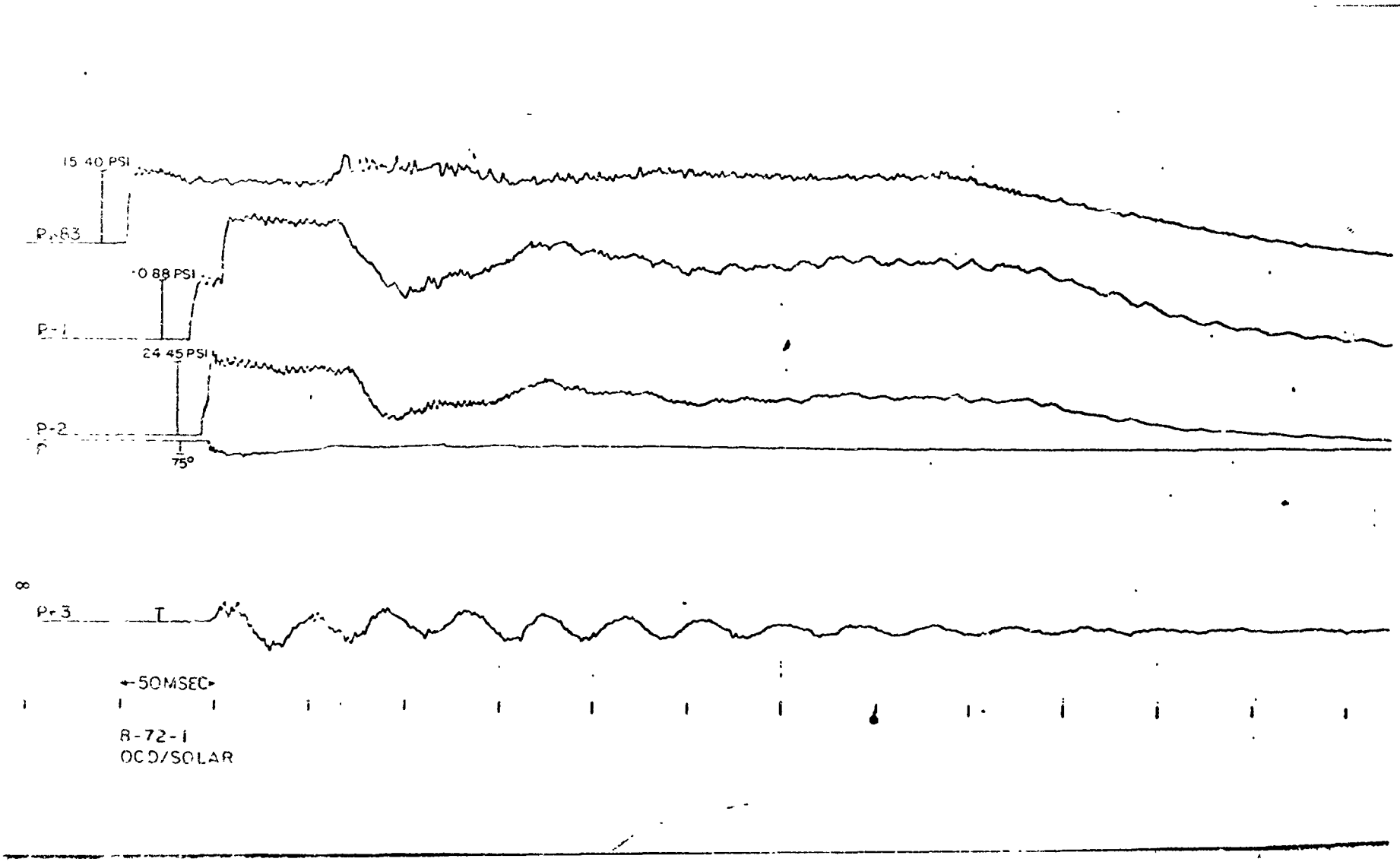

Figure 2. Records

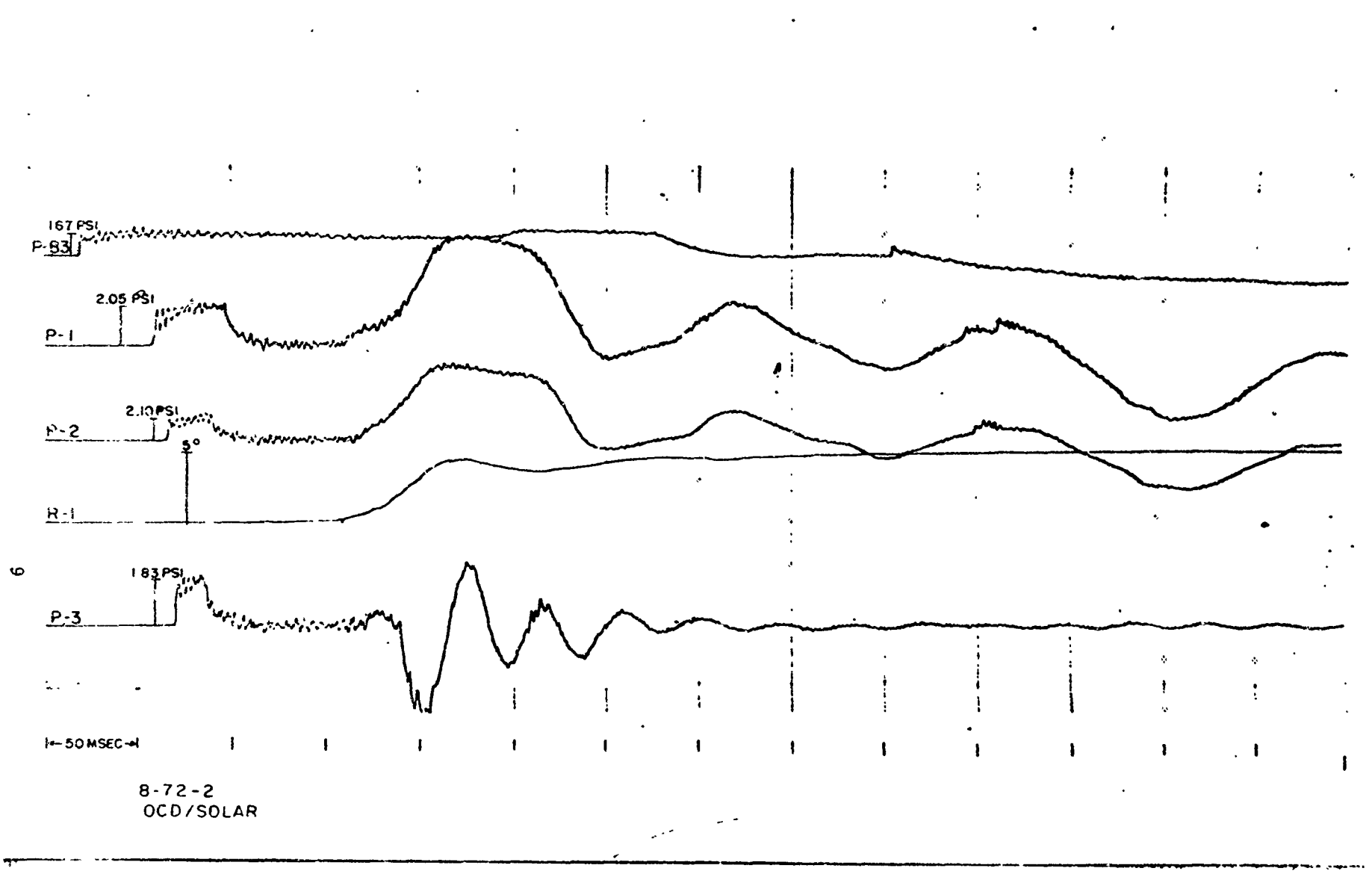

Figure 3. Records

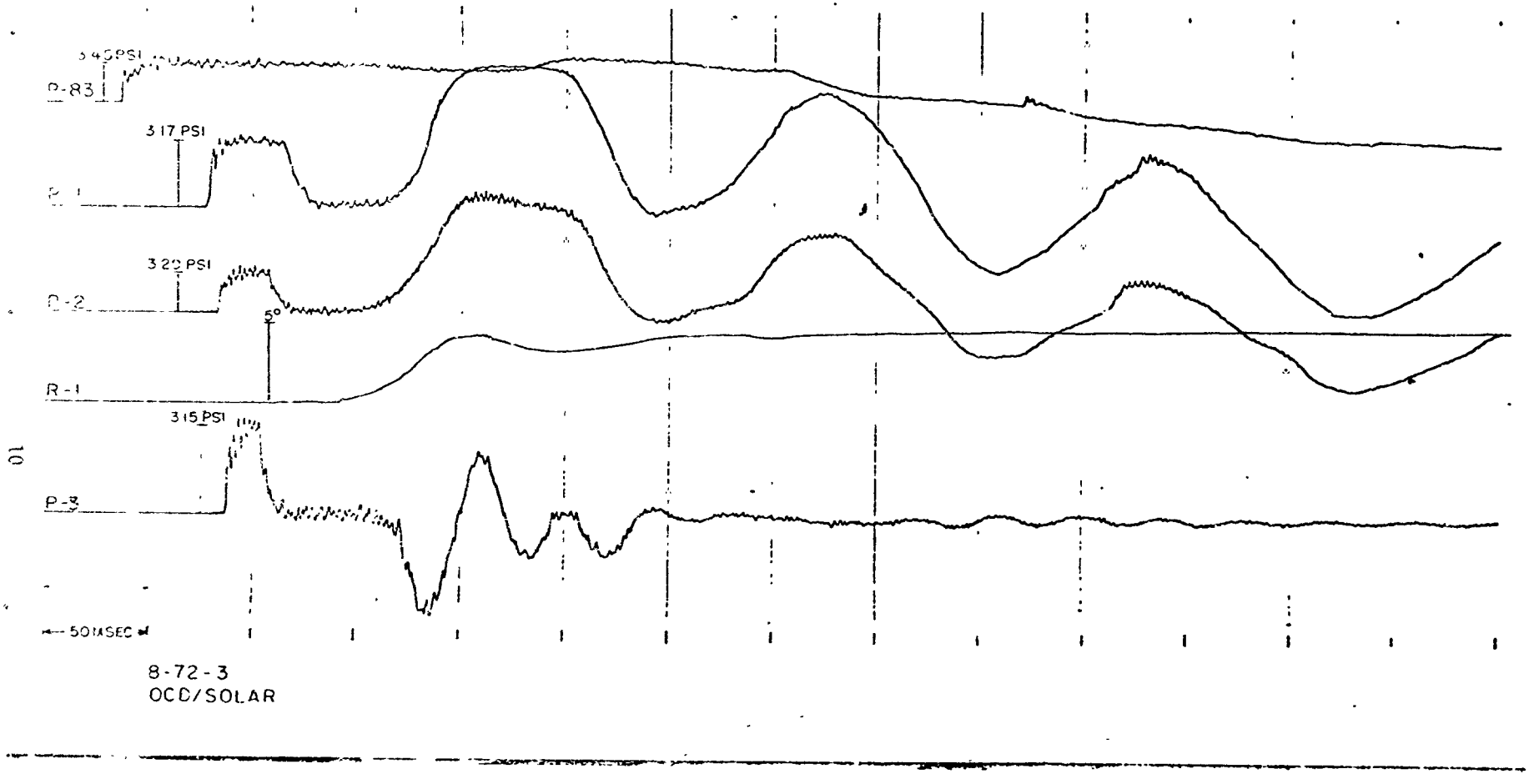

Figure 4. Records

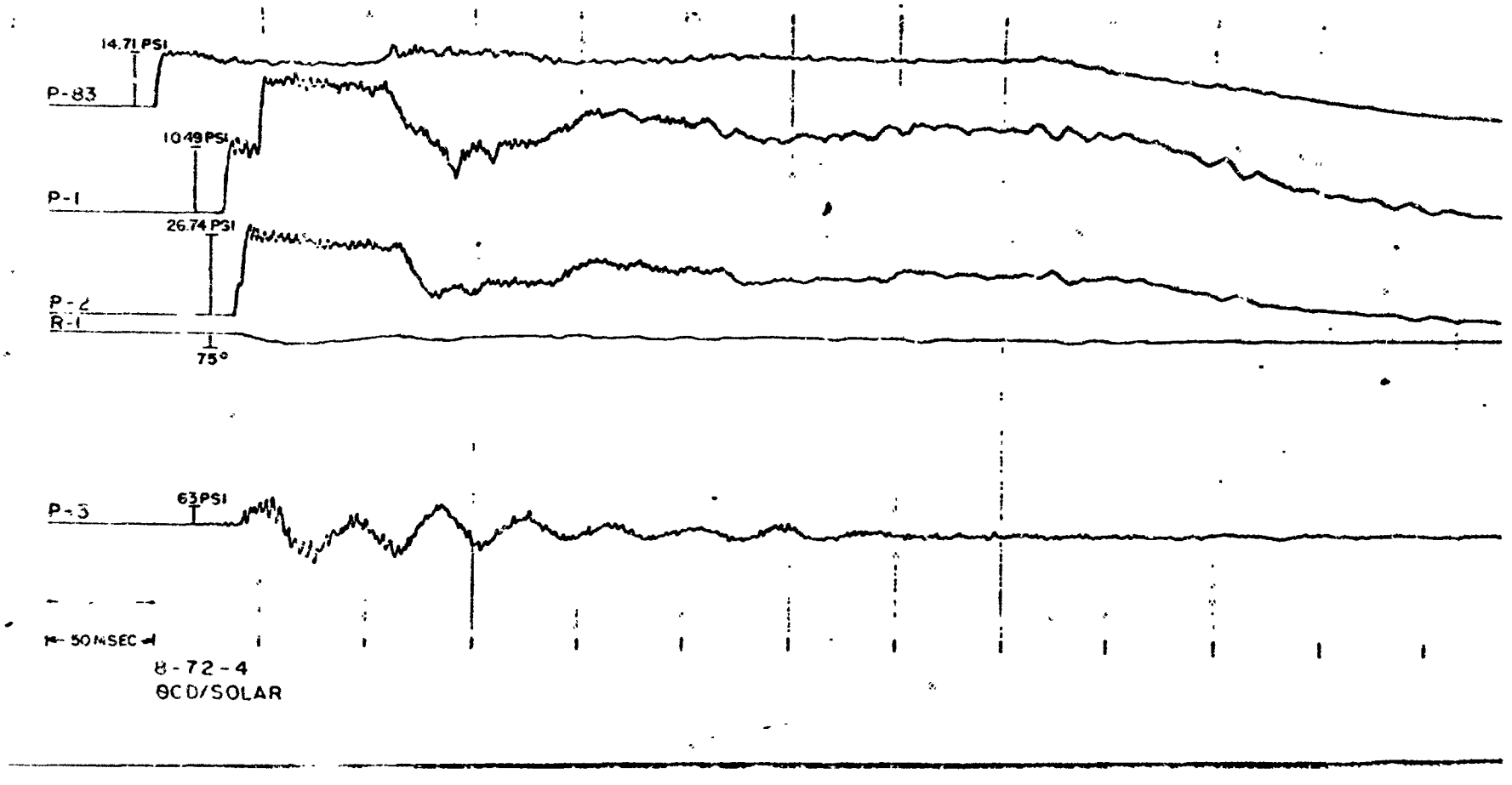

Figure 5. Records

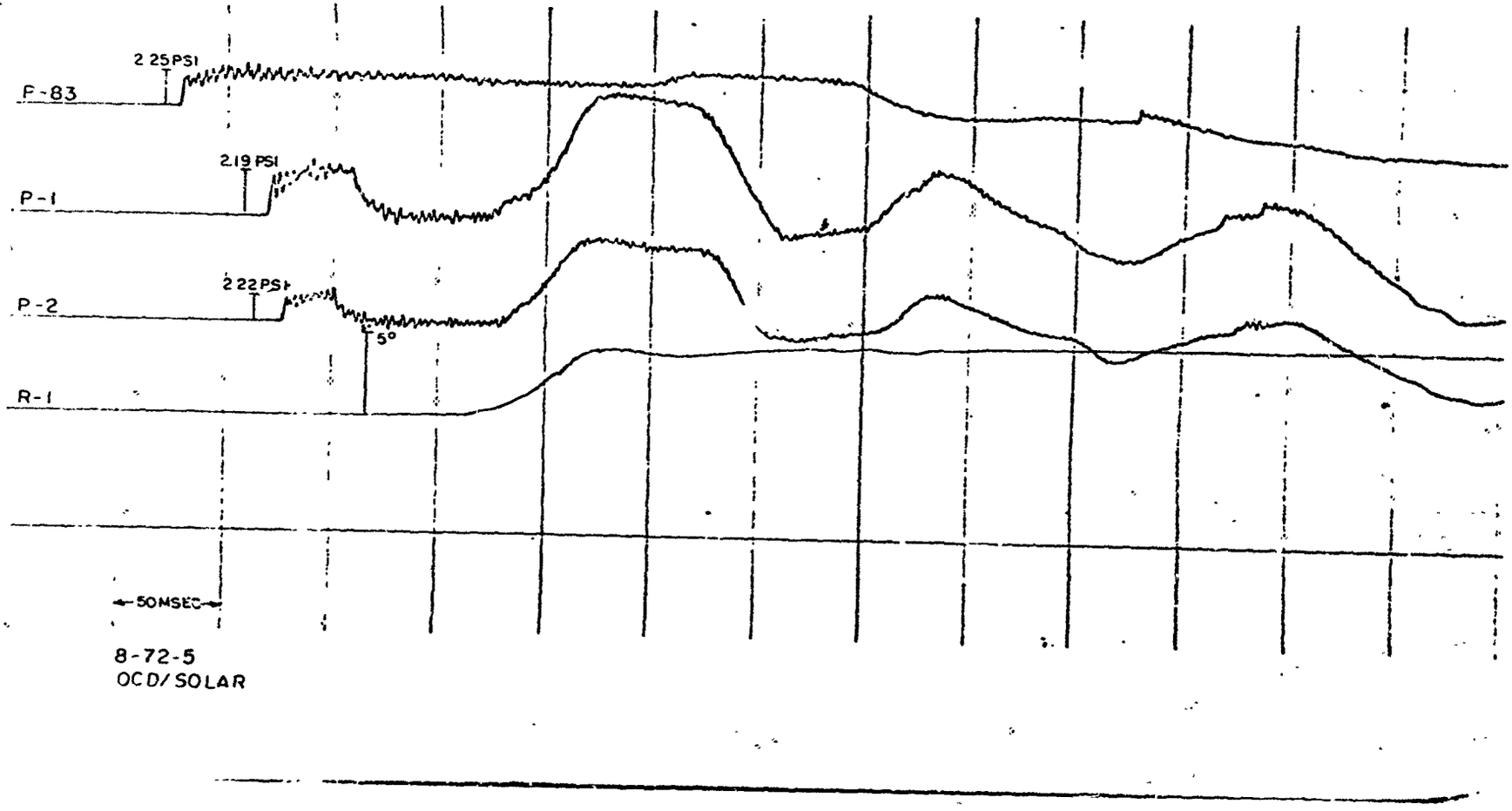

Figure 6. Records

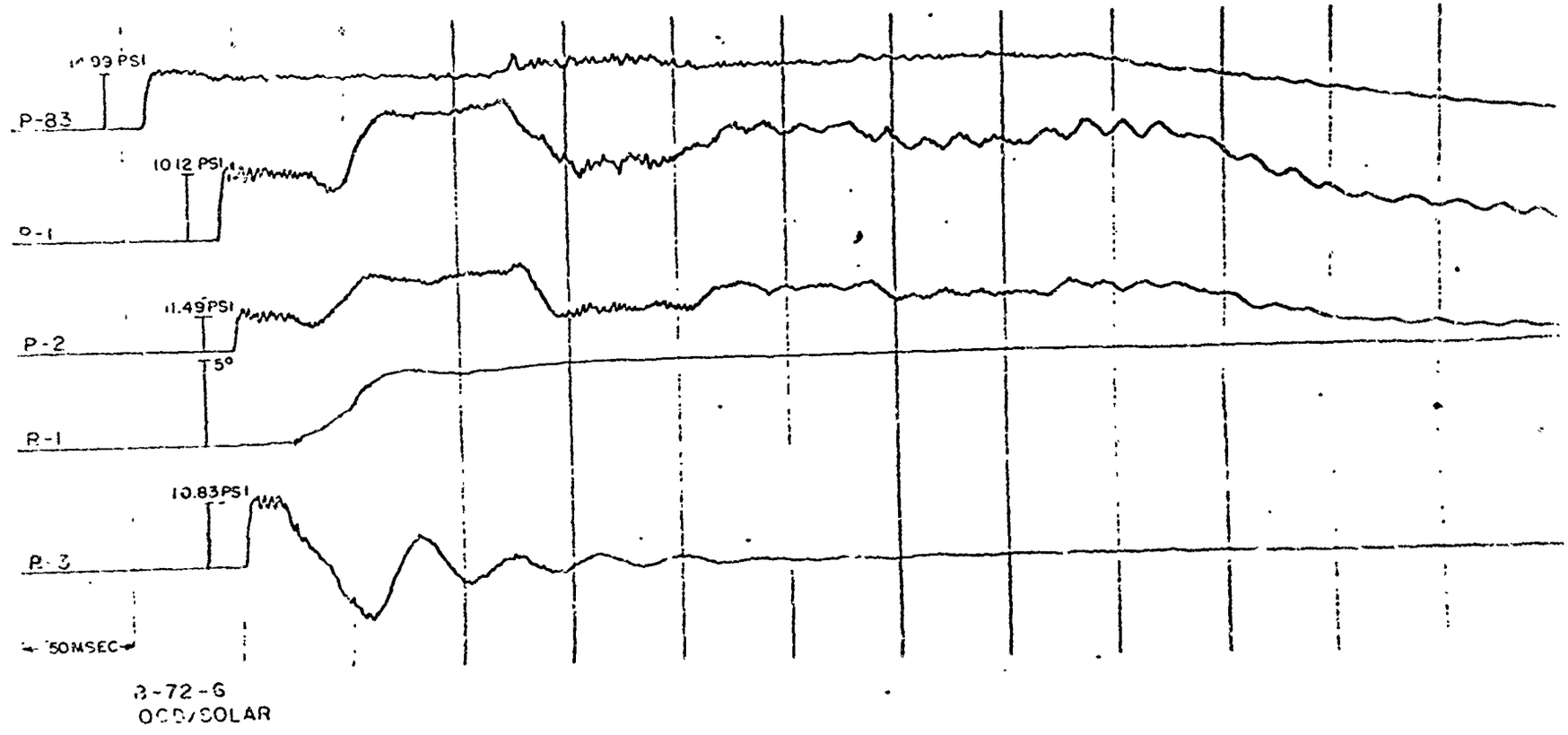

Figure 7. Records